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FACSIMILE COVER SHEET

TO:	Magdalen Greenlief Office of the Commissioner for Patents
FROM:	Raymond A. DiPerna
RE:	U.S. Patent Appln. No. 10/580,327 Attorney Docket No. 00862.514141.
FAX NO.:	571-273-0125
DATE:	October 25, 2007 **NO. OF PAGES:** *(including cover page)*
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RAYMOND A. DiPERNA, Reg. No. 44,063
(Name of Attorney for Applicants)

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000862.514141. PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	:	Examiner: Not Yet Assigned
YUSUKE MITARAI, ET AL.	)	
	:	Art Unit: 2112
Application No.: 10/580,327	)	
	:	Conf. No.: 5699
Filed: May 24, 2006	)	
	:	
For: CODING METHOD AND APPARATUS, AND COMPUTER PROGRAM AND COMPUTER-READABLE STORAGE MEDIUM	)	October 25, 2007

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

LETTER SUBMITTING PAPERS UNDER PPH PILOT PROGRAM

Sir:

Applicants hereby request accelerated examination of the above-identified application under the Patent and Trademark Office's Patent Prosecution Highway (PPH) Pilot Program based on allowed claims of the Japanese application from which the present application claims priority under 35 U.S.C. § 119. Submitted herewith are the following documents for the accelerated examination:

1) Request For Participation in PPH Pilot Program (Form PTO/SB/20);
2) Japanese Notification of Reasons for Refusal
3) English Translation of Japanese Notification of Reasons for Refusal;
4) Japanese Amendment (in Japanese);
5) English Translation of Japanese Amendment;
6) Japanese Argument (in Japanese);
7) English Translation of Japanese Argument;
8) Japanese Final (Allowed) Claims in Japanese;
9) English Translation of Japanese Final (Allowed) Claims;
10) Verification of Translations;
11) Preliminary Amendment; and
12) Information Disclosure Statement listing the references cited in the Japanese Rejection.

I hereby certify that this correspondence is being transmitted by facsimile to the U.S. Patent and Trademark Office at (571) 273-0125 on
October 25, 2007
(Date of Transmission)

Raymond A. DiPerna, Reg. No. 44,063
(Name of Attorney for Applicant)

Signature

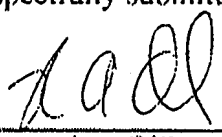
October 25, 2007
Date of Signature

The references of record in counterpart Japanese Patent Application 2004-239792 are cited in the Information Disclosure Statement filed previously in this application on May 24, 2006. Nonetheless, a further Information Disclosure Statement, citing only those references, is submitted herewith.

While it is not believed that a separate Petition to make special is required and that the Request (document 1) fulfills the requirements for such a Petition, should the Office determine that a separate Petition is required, this Letter should be treated as a Petition to make the application special under the Office's PPH Pilot Program. As set forth in the Request, the Petition fee should be charged to Deposit Account 06-1205.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,



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PTO/SB/20 (09-07)
Approved for use through 12/31/2008. OMB 0651-0058
U.S. Patent and Trademark Office; U.S DEPARTMENT OF COMMERCE
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REQUEST FOR PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM BETWEEN THE (1) JPO OR (2) UKIPO, AND THE USPTO

Application No.:	10/580,327	First Named Inventor:	YUSUKE MITARAI
Filing Date:	May 24, 2006	Attorney Docket No.:	00862.514141.
Title of the Invention:	CODING METHOD AND APPARATUS, AND COMPUTER PROGRAM AND COMPUTER-READABLE STORAGE MEDIUM		

THIS REQUEST FOR PARTICIPATION IN THE PPH PILOT PROGRAM MUST BE FAXED TO:
THE OFFICE OF THE COMMISSIONER FOR PATENTS AT 571-273-0125 DIRECTED TO THE ATTENTION OF MAGDALEN GREENLIEF

APPLICANT HEREBY REQUESTS PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM AND PETITIONS TO MAKE THE ABOVE-IDENTIFIED APPLICATION SPECIAL UNDER THE PPH PILOT PROGRAM.

The above-identified application validly claims priority under 35 U.S.C. 119(a) and 37 CFR 1.55 to one or more corresponding JPO application(s) or UKIPO application(s).

The ☒ **JPO** ☐ **UKIPO application number(s) is/are:** 2004-024485 and 2004-239792

The filing date of the ☒ **JPO** ☐ **UKIPO application(s) is/are:** 30 January 2004 and 19 August 2004

I. List of Required Documents:

a. **A copy of all JPO office actions (excluding "Decision to Grant a Patent"*) in the above-identified JPO application(s), or a copy of all UKIPO office actions in the above-identified UKIPO application(s).**

☒ Is attached.

☐ Is available via Dossier Access System. Applicant hereby requests that the USPTO obtain these documents via the Dossier Access System.

*It is not necessary to submit a copy of the "Decision to Grant a Patent" and an English translation thereof.

b. **A copy of all claims which were determined to be patentable by the JPO in the above-identified JPO application(s), or a copy of all claims which were determined to be patentable by the UKIPO in the above-identified UKIPO application(s).**

☒ Is attached.

☐ Is available via Dossier Access System. Applicant hereby requests that the USPTO obtain these documents via the Dossier Access System.

c. **English translations (where applicable) of the documents in a. and b. above along with a statement that the English translations are accurate are attached.**

Information disclosure statement listing the documents cited in the JPO office actions or UKIPO office actions is attached.

Copies of all documents are attached except for U.S. patents or U.S. patent application publications.

PTO/SB/20 (09-07)
Approved for use through 12/31/2008. OMB 0651-0058
U.S. Patent and Trademark Office: U.S DEPARTMENT OF COMMERCE

REQUEST FOR PARTICIPATION IN THE PATENT PROSECUTION HIGHWAY (PPH) PILOT PROGRAM BETWEEN THE (1) JPO OR (2) UKIPO, AND THE USPTO
(continued)

Application No.:	10/580,327	First Named Inventor:	YUSUKE MITARAI

II. Claims Correspondence Table:

Claims in US Application	Patentable Claims in JP/UKIPO Application	Explanation regarding the correspondence
SEE ATTACHED CLAIMS CORRESPONDENCE TABLE.		

III. All the claims in the US application sufficiently correspond to the patentable/allowable claims in the JPO or UKIPO application.

IV. Payment of Fees:

The Commissioner is hereby authorized to charge the petition fee under 37 CFR 1.17(h) as required by 37 CFR 1.102(d) to ☒ **Deposit Account No.** 06-1205.

☐ **Credit Card. Credit Card Payment Form (PTO-2038) is attached.**

Signature		Date	October 25, 2007
Name (Print/Typed)	Raymond A. DiPerna	Registration Number	44,063

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

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The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

05514141WOUS01

The patentable Claims in the USPTO	The Claims in the JPO	Comment about the correspondence
16	1	Both claims are same.
17	2	Both claims are same.
18	3	Both claims are same.
19	4	Both claims are same.
20	5	Both claims are same.
21	6	Both claims are same.
22	7	Both claims are same.
23	8	Both claims are same.
24	9	JPO Claim depends from 1 through 3, or 5 through 7. US Claim only depends from 16.
25	10	JPO Claim depends from 1 through 3, or 5 through 7. US Claim only depends from 16.
26	11	JPO Claim depends from 1 through 3, or 5 through 7. US Claim only depends from 16.
27	12	JPO Claim depends from 1 through 3, or 5 through 7. US Claim only depends from 16.
28	13	Both claims are same.
29	14	Both claims are same.
30	15	JPO Claim depends from 1 through 3, or 5 through 7. US Claim only depends from 16.
31	16	JPO Claim depends from 5 through 7. US Claim only depends from 20.
32	17	JPO Claim depends from 5 through 7. US Claim only depends from 20.
33	18	JPO Claim depends from 5 through 7. US Claim only depends from 20.
34	19	JPO Claim depends from 5 through 7. US Claim only depends from 20.
35	20	JPO Claim depends from 5 through 7. US Claim only depends from 20.
36	21	Both claims are same.
37	22	Both claims are same.
38	23	Both claims are same.
39	24	Both claims are same.
40	25	Both claims are same.
41	26	Both claims are same.
42	27	Both claims are same.
43	28	Both claims are same.
44	29	Both claims are same.
45	30	Both claims are same.
46	31	Both claims are same.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of

Inventors: Yusuke MITARAI, Masakazu MATSUGU, Katsuhiko MORI, Takashi MORIE

Application No.: 10/580,327

Title: CODING METHOD AND APPARATUS, AND COMPUTER PROGRAM AND COMPUTER-READABLE STORAGE MEDIUM

VERIFIED TRANSLATION OF DOCUMENTS
CONCERNING JAPANESE PATENT APPLICATION

The undersigned, of the below address, hereby certifies that he/she well knows both the English and Japanese Languages, and that the attached are accurate translations of the documents listed below concerning Japanese Patent Application No.: 2004-239792

Notification of Reason for Refusal
Argument
Amendments
Final Claims

Signed this 28 day of August, 2007

Signature: Kazuo Eda

Name: Kazuo Eda

Address: Ohtsuka Patent Office
7th Fl., Shuwa Kioicho Park Bldg.
3-6, Kioicho, Chiyoda-ku, Tokyo, Japan

Patent No. 3833224

[Claims]

[Claim 1]

A method for encoding n data to be encoded, into an adaptive base each of which includes m data, characterized by comprising:

an initializing step of initializing the adaptive base;

a reconstruction step of reconstructing n data from the adaptive base using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting said adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

[Claim 2]

A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, characterized by comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of reconstructing n data from said at least two adaptive bases using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting the at least two adaptive bases based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

[Claim 3]

A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, characterized by comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of generating element reconstruction data configured of n data, from one adaptive base using a predetermined conversion;

an error calculation step of calculating an error between difference data to be encoded and said element reconstruction data by using a predetermined error evaluation function;

a correction step of correcting said one adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged, and if

it is determined that said error has converged, said correction in said correction step for a next new adaptive base or a new set of one dimensional adaptive bases.

[Claim 4]

The data encoding method, wherein said data to be encoded are data $f(x_1, x_2, \ldots, x_k)$ in k-dimensional space distribution, and said data to be encoded according to claim 3 is represented by, using at least one set of k one-dimensional adaptive base groups $X_1(x_1)$, $X_2(x_2)$, ..., $X_k(x_k)$,

$$f(x_1, x_2, \ldots, x_k) = \sum_l \prod_k x_{kl}(x_k) .$$

[Claim 5]

A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into k one-dimensional adaptive base groups $X_1(x_1)$, $X_2(x_2)$, ..., $X_k(x_k)$, characterized by comprising;

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base groups based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k) .$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting the one-dimensional adaptive base groups based on said error.

[Claim 6]

A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, characterized by comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base group based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k) .$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said adaptive base groups based on said error.

[Claim 7]

A method for encoding data to be encoded in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, characterized by comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of generating element reconstructed data from the one pair of the one-dimensional adaptive base groups based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k \prod x_k(x_k) .$$

an error calculation step of calculating an error between said data to be encoded and said element reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said one pair of the one-dimensional adaptive base groups based on said error.

[Claim 8]

The method according to claim 3, wherein the difference data to be encoded is obtained by subtracting, from data to be encoded, all of the adaptive bases when said error in said error calculation step has converged or the element reconstructed data reconstructed from the one-dimensional adaptive base groups.

[Claim 9]

The method according to any one of claims 1-3 and 5-7, wherein said correction in said correction step is repeated until said error is equal to or less than a predetermined target error.

[Claim 10]

The method according to any one of claims 1-3 and 5-7, wherein the predetermined error evaluation function calculates a total of the second power of the error between the data to be encoded or the difference data to be encoded and the reconstructed data or the element reconstructed data.

[Claim 11]

The method according to any one of claims 1-3 and 5-7, wherein in said correction step, the adaptive bases or the one-dimensional adaptive base group is corrected so as to reduce the error.

[Claim 12]

The method according to any one of claims 1-3 and 5-7, wherein in said correction step, the correction amount for the adaptive bases or the one-dimensional adaptive base group is obtained by multiplying a predetermined coefficient to a partial differentiation coefficient of element to be corrected in the adaptive base or the one-dimensional adaptive base group in the predetermined error evaluation function.

[Claim 13]

The method according to claim 12, wherein the predetermined coefficient is a negative constant.

[Claim 14]

The method according to claim 12, wherein the predetermined coefficient is a negative and is changed so as to approximate it to "0" in stages.

[Claim 15]

The method according to any one of claims 1-3 and 5-7, wherein the data to be encoded is divided for a unit of a predetermined range, and the encoding is made for each the predetermined range.

[Claim 16]

The method according to any one of claims 1-3 and 5-7, wherein the data to be encoded is divided for spatially a unit of predetermined space, and the encoding is made for each predetermined range.

[Claim 17]

The method according to any one of claims 5-7, wherein the data to be encoded is converted into frequency spaces for encoding.

[Claim 18]

The method according to any one of claims 5-7, wherein the data to be encoded is converted into frequency spaces, and divided into predetermined ranges in the space for encoding for each predetermined range.

[Claim 19]

The method according to any one of claims 5-7, wherein the data to be encoded is divided into spatially predetermined ranges for encoding for each predetermined range.

[Claim 20]

The method according to any one of claims 5-7, wherein the data to be encoded is divided into spatially predetermined ranges to convert into frequency spaces for each predetermined range and a predetermined component converted into the predetermined frequency spaces is composited as a frequency data, wherein the encoding is made for the frequency data.

[Claim 21]

A product-sum arithmetic method for executing product-sum arithmetic of k-dimensional weight distribution data $w(x_1, x_2, \ldots, x_k)$ and data A $(x_1, x_2, \ldots, x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot w(x_1, x_2, \ldots, x_k) dx_1 dx_2 \ldots dx_k ,$$

said method characterized by comprising:

encoding the k-dimensional weight distribution data into at least one set of k one-dimensional adaptive bases $X_{11}(x_1), X_{21}(x_2), \ldots, X_{k1}(x_k)$ using the data encoding method according to any one of claims 5-7,

obtaining the product-sum using the data A and the one-dimensional adaptive base group based on

$$y=\sum_{i}\left[\iint\cdots\int A(x_1,x_2,\ldots,x_k)\cdot\prod_{k}x_{ki}(x_k)dx_1dx_2\ldots dx_k\right].$$

[Claim 22]

A encoding apparatus which encodes n data to be encoded into adaptive base which includes m data, characterized by comprising:

initializing means for initializing the adaptive base;

reconstruction means for reconstructing n data from the adaptive base using a predetermined conversion;

error calculation means for calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

correction means for correcting said adaptive base based on said error; and

determination means for determining whether or not said error calculated by said error calculation means has converged,

wherein correction of said correction means is repeated until it is determined that said error has converged.

[Claim 23]

A encoding method for encoding data in k-dimension to be encoded into k one-dimensional adaptive base groups, characterized by comprising:

a storing step of storing the data to be encoded into a predetermined memory;

an initializing step of allocating and initializing a memory for storing the k one-dimensional adaptive bases;

a reconstruction step of reconstructing data in k-dimension from the adaptive base stored in the memory, using a predetermined conversion;

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

a determination step of determining whether or not the adaptive bases are corrected based on the error obtained in the error calculation step, correcting the adaptive bases in the memory, and repeating the processes of said reconstruction step and said error calculation step, if it is determined that the adaptive bases are corrected, while, outputting the latest adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

[Claim 24]

The method according to claim 23, wherein said determination determines whether or not the adaptive bases are corrected in accordance with whether or not the error has converged,

wherein said method adds a group of k one-dimensional adaptive base if the error has converged and the error between the data to be encoded and the reconstructed data equal to or more than a predetermined value.

[Claim 25]

A encoding apparatus which encodes data in k-dimension to be encoded into k one-dimensional adaptive base groups, characterized by comprising:

data storing means for storing the data to be encoded into a predetermined memory;

base storing means for storing k one-dimensional adaptive base groups;

initializing means for initializing the k one-dimensional adaptive bases stored in said base storing means;

reconstruction means for reconstructing k-dimensional data from the k one-dimensional adaptive bases stored in the base storing means, using a predetermined conversion;

error calculation means for calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

determination means for determining whether or not the adaptive bases are corrected based on the error obtained by said error calculation means, correcting the adaptive bases stored in said base storing means, and repeating the processes of said reconstruction means and said error calculation means , if it is determined that the adaptive bases are corrected, while, outputting the latest adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

[Claim 26]

A product-sum arithmetic apparatus which executes product-sum arithmetic of k-dimensional weight distribution data $w(x_1, x_2, \ldots, x_k)$ and data $A(x_1, x_2, \ldots, x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot w(x_1, x_2, \ldots, x_k) dx_1 dx_2 \ldots dx_k ,$$

said apparatus characterized by

encoding the k-dimensional weight distribution data into at least one group of k one-dimensional adaptive bases $X_{11}(x_1), X_{21}(x_2), \ldots, X_{k1}(x_k)$ using the data encoding method according to any one of claims 5-7,

obtaining the product-sum using the data A and the one-dimensional adaptive base group based on

$$y = \sum_l \left[\iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot \prod_k x_{kl}(x_k) dx_1 dx_2 \ldots dx_k \right].$$

[Claim 27]

The apparatus according to claim 26, wherein arithmetic elements performing the product-sum are arranged in an array.

[Claim 28]

The apparatus according to claim 27, wherein one-dimensional adaptive base group is inputted into all of the arithmetic elements arranged in the array.

[Claim 29]

The apparatus according to claim 28, wherein all of the arithmetic elements arranged in the array perform the product-sum.

[Claim 30]

The apparatus according to claim 27, wherein one-dimensional adaptive base group is inputted into a portion of columns and row of the arithmetic elements arranged in the array.

[Claim 31]

The apparatus according to claim 30, wherein a portion of columns and row of the arithmetic elements arranged in the array perform the product-sum.

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H04N	1/41	(2006.01)	H04N	1/41	B
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(54)【発明の名称】符号化方法及び装置、並びにコンピュータプログラム及びコンピュータ可読記憶媒体

(57)【特許請求の範囲】

【請求項１】

ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する方法であって、

前記適応化基底を初期化するステップと、

所定の変換により前記適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記適応化基底を修正する修正ステップと、

前記算出した誤差の収束を判定するステップと

を有し、前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行うことを特徴とするデータ符号化方法。

【請求項２】

ｎ個のデータで構成される被符号化データを、少なくとも２つの、ｐ個のデータで構成される適応化基底に符号化する方法であって、

前記適応化基底を初期化するステップと、

所定の変換により前記少なくとも２つの適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、

所定の誤差評価関数により、前記被符号化データと前記復元データとの誤差を算出する

誤差算出ステップと、
前記誤差に基づき前記少なくとも２つの適応化基底を修正する修正ステップと、
前記算出した誤差の収束を判定するステップと
を有し、前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行うことを特徴とするデータ符号化方法。
【請求項３】
ｎ個のデータで構成される被符号化データを、少なくとも２つの、ｐ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、
所定の変換により１つの前記適応化基底から、ｎ個のデータからなる要素復元データを生成する復元ステップと、
所定の誤差評価関数により、差分被符号化データと前記要素復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記１つの適応化基底を修正する修正ステップと、
前記算出した誤差の収束を判定するステップとを有し、
前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行い、前記誤差が収束したと判定された場合に、次の新たな適応化基底、若しくは新たな１次元適応化基底組に対し、前記修正ステップを行う
ことを特徴とするデータ符号化方法。
【請求項４】
被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、請求項３に記載の前記被符号化データを用いて、少なくとも１組の、ｋ個の１次元適応化基底組$X_1(x_1)$、$X_2(x_2)$、…$X_k(x_k)$を生成し、

$$f(x_1,x_2,\cdots,x_k)=\sum\prod_k X_{kl}(x_k)$$

と展開表現することを特徴とするデータ符号化方法。
【請求項５】
被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、ｋ個の１次元適応化基底組$X_1(x_1)$、$X_2(x_2)$…、$X_k(x_k)$に符号化する方法であって、
前記１次元適応化基底組を初期化するステップと、
前記１次元適応化基底組から、復元データを次式で生成する復元ステップと、

$$\tilde{f}(x_1,x_2,\cdots,x_k)=\prod_k X_k(x_k)$$

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記１次元適応化基底組を修正する修正ステップと
を有することを特徴とするデータ符号化方法。
【請求項６】
被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、少なくとも２組の、ｋ個の１次元適応化基底組に符号化する方法であって、
前記１次元適応化基底組を初期化するステップと、
前記１次元適応化基底組から、復元データを次式で復元する復元ステップと、

$$\tilde{f}(x_1,x_2,\cdots,x_k)=\sum\prod_k X_{kl}(x_k)$$

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記１次元適応化基底組を修正する修正ステップと

を有することを特徴とするデータ符号化方法。

【請求項７】

被符号化データであるｋ次元空間分布データ を、少なくとも２組の、ｋ個の１次元適応化基底組 に符号化する方法であって、

前記１次元適応化基底組を初期化するステップと、

１組の前記１次元適応化基底組から、要素復元データを次式で生成する復元ステップと

$$\tilde{f}_i(x_1, x_2, \cdots, x_k) = \prod_k X_{ij}(x_k)$$

所定の誤差評価関数により、差分被符号化データと前記要素復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記１組の１次元適応化基底組を修正する修正ステップと

を有することを特徴とするデータ符号化方法。

【請求項８】

前記差分被符号化データは、前記被符号化データから、前記誤差の収束を判定するステップにより、前記誤差が収束したと判定された全ての前記適応化基底、若しくは前記１次元適応化基底組から復元される前記要素復元データを差し引いたものであることを特徴とする請求項３に記載のデータ符号化方法。

【請求項９】

前記修正ステップを、前記算出した誤差が予め定めた目標誤差以下になるまで繰り返し行うことを特徴とする請求項１乃至請求項３、請求項５乃至請求項７のいずれか１項に記載の記載のデータ符号化方法。

【請求項１０】

前記誤差評価関数は、前記符号化データ、若しくは前記差分被符号化データと、前記復元データ、若しくは前記要素復元データの各要素との２乗誤差の総和であることを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１１】

前記修正ステップにおいて、前記算出した誤差が減少するように、前記適応化基底、若しくは前記１次元適応化基底組の修正を行うことを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１２】

前記修正ステップにおいて、前記適応化基底、若しくは前記１次元適応化基底組の修正量は、前記誤差評価関数の、前記適応化基底の内の修正する要素、若しくは前記１次元適応化基底組の内の修正する要素での偏微分係数に、所定の係数を乗じたものであることを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１３】

前記所定の係数は、負の定数であることを特徴とする請求項１２に記載のデータ符号化方法。

【請求項１４】

前記所定の係数は、負の値であり、徐々に０に近づけることを特徴とする請求項１２に記載のデータ符号化方法。

【請求項１５】

前記被符号化データを、所定範囲で分割し、前記所定範囲ごとに符号化を行うことを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１６】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに符号化を行う

ことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１７】

前記被符号化データを、周波数空間に変換し符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項記載のデータ符号化方法。

【請求項１８】

前記被符号化データを、周波数空間に変換し、周波数空間において所定範囲に分割し、前記所定範囲ごとに符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１９】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに周波数空間に変換し符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項２０】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに周波数空間に変換し、前記周波数空間に変換された所定範囲ごとの所定周波数成分を周波数データとして合成し、前記周波数データの符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項２１】

ｋ次元荷重分布データｗ（x_1、x_2、…、x_k）と、ｋ次元分布データである被積和演算データＡ（x_1、x_2、…、x_k）とを次式で積和演算を行う積和演算方法であって、

$$y = \iint\cdots\int A(x_1,x_2,\cdots,x_k)\cdot w(x_1,x_2,\cdots,x_k)dx_1dx_2\cdots dx_k$$

前記ｋ次元荷重分布データを、請求項５乃至７のいずれか１項に記載のデータ符号化方法により、少なくとも１組の、ｋ個の１次元適応化基底組X_{11}（x_1）、X_{21}（x_2）、…、X_{k1}（x_k）に符号化し、

前記被積和演算データと、前記１次元適応化基底組を用いて、前記積和演算を次式で求める

$$y = \sum\left[\iint\cdots\int A(x_1,x_2,\cdots,x_k)\cdot\prod_k X_{kl}(x_k)dx_1dx_2\cdots dx_k\right]$$

ことを特徴とする積和演算方法。

【請求項２２】

ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する装置であって、

前記適応化基底を初期化する手段と、

所定の変換により前記適応化基底から、ｎ個のデータからなる復元データを生成する復元手段と、

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出手段と、

前記誤差に基づき前記適応化基底を修正する修正手段と、

前記算出した誤差の収束を判定する判定手段と

を有し、前記誤差が収束したと判定されるまで、前記修正手段による修正を繰り返し行うことを特徴とするデータ符号化装置。

【請求項２３】

ｋ次元の被符号化データを、ｋ個の一次元適応化基底の組に符号化するデータ符号化方法であって、

被符号化データを所定のメモリに記憶する記憶ステップと、

前記ｋ個の一次元適応化基底をメモリに確保し、初期化する初期化ステップと、

所定の変換により、前記メモリ内の一次元適応化基底から、ｋ次元の復元データを生成

する復元ステップと、
所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
該誤差演算ステップで得られた誤差に基づき、前記適応化基底を修正するか否かを判定し、前記適応化基底を修正すると判定した場合には前記メモリの適応化基底を修正して、前記復元ステップ、誤差演算ステップを繰り返し、前記適応化基底を修正しないと判定した場合には、最後の適応化基底を符号化結果として出力する判定ステップと
を備えることを特徴とするデータ符号化方法。
【請求項２４】
前記判定ステップは、誤差が収束したか否かに基づいて適応化基底を修正するか否かを判定し、
収束したと判定した場合であって、被符号化データと前記復元データとの誤差が所定値以上の差を有する場合には、ｋ個の一次元適応化基底の組を更に追加することを特徴とする請求項２３に記載のデータ符号化方法。
【請求項２５】
ｋ次元の被符号化データを、ｋ個の一次元適応化基底の組に符号化するデータ符号化装置であって、
被符号化データを所定のメモリに記憶する被符号化データ記憶手段と、
前記ｋ個の一次元適応化基底を記憶する基底記憶手段と、
該基底記憶手段に記憶されたｋ個の一次元適応化基底を初期化する初期化手段と、
所定の変換により、前記基底記憶手段に記憶されたｋ個の一次元適応化基底から、ｋ次元の復元データを生成する復元手段と、
所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出手段と、
該誤差演算手段で得られた誤差に基づき、前記適応化基底を修正するか否かを判定し、前記適応化基底を修正すると判定した場合には前記基底記憶手段に記憶された適応化基底を修正して、前記復元手段、誤差演算手段を繰り返し、前記適応化基底を修正しないと判定した場合には、最後の適応化基底を符号化結果として出力する判定手段と、
を備えることを特徴とするデータ符号化装置。
【請求項２６】
ｋ次元荷重分布データｗ（ｘ１、ｘ２、…、ｘｋ）と、ｋ次元分布データである被積和演算データＡ（ｘ１、ｘ２、…、ｘｋ）とを次式で積和演算を行う積和演算装置であって、

$$y = \iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot w(x_1, x_2, \cdots, x_k) dx_1 dx_2 \cdots dx_k$$

前記ｋ次元荷重分布データを、請求項５乃至７のいずれか１項に記載のデータ符号化方法により、少なくとも１組の、ｋ個の１次元適応化基底組Ｘ$_{i1}$（ｘ$_i$）、Ｘ$_{j1}$（ｘ$_j$）、…、Ｘ$_{k1}$（ｘ$_k$）に符号化し、
前記被積和演算データと、前記１次元適応化基底組を用いて、前記積和演算を次式で求める

$$y = \sum_i \left[\iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot \prod_u X_{u1}(x_u) dx_1 dx_2 \cdots dx_k \right]$$

ことを特徴とする積和演算装置。
【請求項２７】
前記積和演算装置において、積和演算を行なう演算素子がアレイ状に構成されていることを特徴とする請求項２６記載の積和演算装置。
【請求項２８】
前記積和演算装置において、１次元適応化基底組がアレイ状に構成された演算素子全てに入力されることを特徴とする請求項２７に記載の積和演算装置。

【請求項２９】
前記積和演算装置において、アレイ状に構成された演算素子全てにおいて前記積和演算が実行されることを特徴とする請求項２８に記載の積和演算装置。
【請求項３０】
前記積和演算装置において、１次元適応化基底組が、アレイ状に構成された演算素子の列・行のそれぞれ一部に入力されることを特徴とする請求項２７に記載の積和演算装置。
【請求項３１】
前記積和演算装置において、アレイ状に構成された演算素子の一部において前記積和演算が実行されることを特徴とする請求項３０に記載の積和演算装置。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、データの符号化、特に２次元画像や３次元密度分布等の多次元空間における分布データの符号化技術に関するものである。
【背景技術】
【０００２】
２次元画像等の多次元分布データを符号化する技術としては、ＪＥＰＧ形式の圧縮技術のような、２次元画像データに対し離散コサイン変換を行い、変換されたデータに所定の量子化を行い、それをハフマン符号化等により符号化することで、データ量を圧縮する技術等が一般的である。
【０００３】
また、画像データを予測符号化し、予測符号化による予測誤差データをブロック分割し、ブロック毎に予測誤差の大きいブロックか小さいブロックかを判別しする手法もある（特許文献１）。この文献では、予測誤差の大きいブロックにはベクトル量子化を適用し、ベクトル量子化により検索されたコードブックのベクトル値と予測誤差との差分値を計算し、この差分値と予測誤差の小さいブロックにおける予測誤差をエントロピー符号化し、エントロピー符号とブロック大小判別フラッグとベクトル量子化によるインデックスとを用いて符号化データを作成するものである。このように、省スペースでのデータ保持、高速通信等の観点から、高効率なデータ符号化技術が望まれている。
【０００４】
また、まったく別の観点ではあるが、画像処理等で多用される所定の２次元荷重分布データによる、２次元画像に対する離散的コンボリューション演算を行う演算器において、積和演算素子を大規模並列化し、高速な演算を可能にすることが期待されている。しかし配線の問題等から、積和演算を２次元的に並列化して実行することは困難であった。従って、コンボリューションの２次元荷重分布データを１次元の基底組に分解する方法が望まれている。
【特許文献１】特開平１１－３３１８５２号公報
【発明の開示】
【発明が解決しようとする課題】
【０００５】
本発明は、このような点に鑑みなされたものであり、高効率なデータの符号化、特に２次元画像等の多次元空間における分布データ等を、幾つかの一次元の基底に分解し、符号化する技術を提供とするものである。
【課題を解決するための手段】
【０００６】
この課題を解決するため、例えば本発明の符号化方法は以下の工程を備える。すなわち

ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、

Reference No. 0002623-01 Dispatch No. 162251
Dispatch Date: April 21, 2006

Notification of Reasons for Refusal

Patent Application No.	2004-239792
Drafting Date	April 17, 2006
JPO Examiner	Tomohiko KITAMURA 9297 5K00
Agent	Yasunori Ohtsuka (three others)
Applied Provision	Patent Law Section 29(2)
	Patent Law Section 36

This application is refused for the reason mentioned below. If the applicant has any argument against the reason, such argument should be submitted within 60 days from the date on which this notification was dispatched.

Reason

A. The inventions in the claims mentioned below of the subject application should not be granted a patent under Patent Law Section 29(2) since it could have easily been made by persons who have common knowledge in the technical field to which the inventions pertain, on the basis of the inventions described in the publications listed below which was distributed in Japan or foreign countries prior to the filing of the subject application, or the inventions available for the public through telecommunication lines prior to the filing of the subject application.

Note (The list of cited documents etc. is provided later)

·Claims: 1 through 3, 8, 12 through 14, 18, 24, 25, 27

·Cited Reference: 1

·Comments:

The cited reference 1 discloses a data encoding method that encodes an encoded data that is configured of n data elements into a base that is configured of m data elements, the method comprising the steps of initializing the base, generating a restored data that is configured of n data elements, using a prescribed error assessment function to compute an error between the data to be encoded and the restored data, and correcting the base in accordance with the error.

B. The subject application does not comply with the requirements under Patent Law Section 36 on the points mentioned below.

While the invention according to claims 24 and 25 is recited as a decoding method that is dependent upon a claim that is an encoding method, it is unclear as to what sort of configuration is being referenced. It is thus not possible to clearly ascertain the comprised configuration as to the invention of the decoding method. It is unclear as to whether all steps of the encoding method are present or not. The decoding method configuration discloses only "using a prescribed transformation to decode from a one-dimensional base assembly". The invention according to claims 24 and 25 is thus unclear.

List of cited references etc.

1. Japanese Patent Laid-Open No. 08-212193

Record of the results of prior art search

·Technical fields searched: IPC H03M3/00-11/00

・Prior art documents:

Japanese Patent Laid-Open No. 06-237179

Japanese Patent Laid-Open No. 10-028058

Japanese Patent Laid-Open No. 2001-326935

This record is not part of the reason for refusal.

Japanese Patent Laid-Open No. 06-237179

Any inquiry concerning this notification [or request for interview concerning this application] should be directed to:

Tomohiko KITAMURA, Digital communication Division, Fourth Patent Examination Department

TEL: 03-3597-1993

拒絶理由通知書

特許出願の番号	特願２００４－２３９７９２
起案日	平成１８年　４月１７日
特許庁審査官	北村　智彦　９２９７　５Ｋ００
特許出願人代理人	大塚　康徳（外　３名）　様
適用条文	第２９条第２項、第３６条

この出願は、次の理由によって拒絶をすべきものである。これについて意見があれば、この通知書の発送の日から６０日以内に意見書を提出して下さい。

理　由

A．この出願の下記の請求項に係る発明は、その出願前日本国内又は外国において頒布された下記の刊行物に記載された発明又は電気通信回線を通じて公衆に利用可能となった発明に基いて、その出願前にその発明の属する技術の分野における通常の知識を有する者が容易に発明をすることができたものであるから、特許法第２９条第２項の規定により特許を受けることができない。

記　（引用文献等については引用文献等一覧参照）

・請求項１－３，８，１２－１４，１８，２４，２５，２７

・引用文献等　１

・備　考

引用例１には、ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する方法であって、前記適応化基底を初期化するステップと、所定の変換により前記適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、前記誤差に基づき前記適応化基底を修正する修正ステップ（基底ベクトルを選択することで修正を行うステップ）とを有するデータ符号化方法が記載されている。

B．この出願は、特許請求の範囲の記載が下記の点で、特許法第３６条第６項第２号に規定する要件を満たしていない。

記

請求項２４，２５に係る発明において、符号化方法である請求項を引用した復号化方法の請求項として記載されているが、いかなる構成を引用しているのかが

明確でなく、復号化方法の発明としていかなる構成を有するのかが明確に把握できない。

（符号化方法の各ステップを有するものであるのかどうか明確でない。復号化側の構成としては、「１次元適応化基底組から所定の変換で復元データを復元する」ことが記載されているのみである。）

よって、請求項２４，２５に係る発明は明確でない。

この拒絶理由通知書中で指摘した請求項以外の請求項に係る発明については、現時点では、拒絶の理由を発見しない。拒絶の理由が新たに発見された場合には拒絶の理由が通知される。

引 用 文 献 等 一 覧

１．特開平８－２１２１９３号公報

先行技術文献調査結果の記録

・調査した分野　　ＩＰＣ　Ｈ０３Ｍ３／００－１１／００

・先行技術文献

特開平６－２３７１７９号公報

特開平１０－２８０５８号公報

特開２００１－３２６９３５号公報

この先行技術文献調査結果の記録は拒絶理由を構成するものではありません。

特開平６－２３７１７９号公報

この拒絶理由通知の内容に関するお問い合わせ、または面接のご希望がございましたら下記までご連絡下さい。

特許審査第四部デジタル通信　北村　智彦

TEL. 03(3597)1993

[Name of Document] Amendment
[Reference No.] 000262301H
[Date of Submission] May 31, 2007
[Addressee] Commissioner of the Patent Office, Esq.
[Description of the Case]
[Application No.] Patent Application No. 2004-239792
[Person Submitting the Amendment]
[Id. No.] 000001007
[Name] CANON KABUSHIKI KAISHA
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[Id. No.] 100076428
[Patent Attorney]
[Name] Yasunori OHTSUKA
[Phone No.] 03-5276-3241
[Contact] Person in Charge: Yasuhiro OHTSUKA
[Dispatch No.] 162251
[Amendment 1]
[Name of Document to be Amended] WHAT IS CLAIMED IS:
[Name of Item to be Amended] whole text
[Manner of Amendment] Change
[Content of Amendment]
[Document Name] WHAT IS CLAIMED IS:
[Claim 1]

A method for encoding n data to be encoded, into an adaptive base each of which includes m data, characterized by comprising:

an initializing step of initializing the adaptive base;

a reconstruction step of reconstructing n data from the adaptive base using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting said adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

[Claim 2]

A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, characterized by comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of reconstructing n data from said at least two adaptive bases using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting the at least two adaptive bases based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

[Claim 3]

A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, characterized by comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of generating element reconstruction data configured of n data, from one adaptive base using a predetermined conversion;

an error calculation step of calculating an error between difference data to be encoded and said element reconstruction data by using a predetermined error evaluation function;

a correction step of correcting said one adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged, and if it is determined that said error has converged, said correction in said correction step for a next new adaptive base or a new set of one dimensional adaptive bases.

[Claim 4]

The data encoding method, wherein said data to be encoded are data $f(x_1, x_2, \ldots, x_k)$ in k-dimensional space distribution, and said data to be encoded according to claim 3 is represented by, using at least one set of k one-dimensional adaptive base groups $X_1(x_1)$, $X_2(x_2)$, ..., $X_k(x_k)$,

$$f(x_1, x_2, \ldots, x_k) = \sum_l \prod_k x_{kl}(x_k)$$

[Claim 5]

A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into k one-dimensional adaptive base groups $X_1(x_1), X_2(x_2), \ldots, X_k(x_k)$, characterized by comprising;

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base groups based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k)$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting the one-dimensional adaptive base groups based on said error.

[Claim 6]

A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, characterized by comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base group based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k) .$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said adaptive base groups based on said error.

[Claim 7]

A method for encoding data to be encoded in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, characterized by comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of generating element reconstructed data from the one pair of the one-dimensional adaptive base groups based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k) .$$

an error calculation step of calculating an error between said data to be encoded and said element reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said one pair of the one-dimensional adaptive base groups based on said error.

[Claim 8]

The method according to claim 3, wherein the difference data to be encoded is obtained by subtracting, from data to be encoded, all of the adaptive bases when said error in said error calculation step has converged or the element reconstructed data reconstructed from the one-dimensional adaptive base groups.

[Claim 9]

The method according to any one of claims 1-3 and 5-7, wherein said correction in said correction step is repeated until said error is equal to or less than a predetermined target error.

[Claim 10]

The method according to any one of claims 1-3 and 5-7, wherein the predetermined error evaluation function calculates a total of the second power of the error between the data to be encoded or the difference data to be encoded and the reconstructed data or the element reconstructed data.

[Claim 11]

The method according to any one of claims 1-3 and 5-7, wherein in said correction step, the adaptive bases or the one-dimensional adaptive base group is corrected so as to reduce the error.

[Claim 12]

The method according to any one of claims 1-3 and 5-7, wherein in said correction step, the correction amount for the adaptive bases or the one-dimensional adaptive base group is obtained by multiplying a predetermined coefficient to a partial differentiation coefficient of element to be corrected in the adaptive base or the one-dimensional adaptive base group in the predetermined error evaluation function.

[Claim 13]

The method according to claim 12, wherein the predetermined coefficient is a negative constant.

[Claim 14]

The method according to claim 12, wherein the predetermined coefficient is a negative and is changed so as to approximate it to "0" in stages.

[Claim 15]

The method according to any one of claims 1-3 and 5-7, wherein the data to be encoded is divided for a unit of a predetermined range, and the encoding is made for each the predetermined range.

[Claim 16]

The method according to any one of claims 1-3 and 5-7, wherein the data to be encoded is divided for spatially a unit

of predetermined space, and the encoding is made for each predetermined range.

[Claim 17]

The method according to any one of claims 5-7, wherein the data to be encoded is converted into frequency spaces for encoding.

[Claim 18]

The method according to any one of claims 5-7, wherein the data to be encoded is converted into frequency spaces, and divided into predetermined ranges in the space for encoding for each predetermined range.

[Claim 19]

The method according to any one of claims 5-7, wherein the data to be encoded is divided into spatially predetermined ranges for encoding for each predetermined range.

[Claim 20]

The method according to any one of claims 5-7, wherein the data to be encoded is divided into spatially predetermined ranges to convert into frequency spaces for each predetermined range and a predetermined component converted into the predetermined frequency spaces is composited as a frequency data, wherein the encoding is made for the frequency data.

[Claim 21]

A product-sum arithmetic method for executing product-sum arithmetic of k-dimensional weight distribution data $w(x_1, x_2, \ldots, x_k)$ and data $A(x_1, x_2, \ldots, x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot w(x_1, x_2, \ldots, x_k) dx_1 dx_2 \ldots dx_k ,$$

said method characterized by comprising:

encoding the k-dimensional weight distribution data into at least one set of k one-dimensional adaptive bases $X_{11}(x_1), X_{21}(x_2), \ldots, X_{k1}(x_k)$ using the data encoding method according to any one of claims 5-7,

obtaining the product-sum using the data A and the one-dimensional adaptive base group based on

$$y = \sum_l \left[\iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot \prod_k x_{kl}(x_k) dx_1 dx_2 \ldots dx_k \right].$$

[Claim 22]

A encoding apparatus which encodes n data to be encoded into adaptive base which includes m data, characterized by comprising:

initializing means for initializing the adaptive base;

reconstruction means for reconstructing n data from the adaptive base using a predetermined conversion;

error calculation means for calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

correction means for correcting said adaptive base based on said error; and

determination means for determining whether or not said error calculated by said error calculation means has converged,

wherein correction of said correction means is repeated until it is determined that said error has converged.

[Claim 23]

A encoding method for encoding data in k-dimension to be encoded into k one-dimensional adaptive base groups, characterized by comprising:

a storing step of storing the data to be encoded into a predetermined memory;

an initializing step of allocating and initializing a memory for storing the k one-dimensional adaptive bases;

a reconstruction step of reconstructing data in k-dimension from the adaptive base stored in the memory, using a predetermined conversion;

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

a determination step of determining whether or not the adaptive bases are corrected based on the error obtained in the error calculation step, correcting the adaptive bases in the memory, and repeating the processes of said reconstruction step and said error calculation step, if it is determined that the adaptive bases are corrected, while, outputting the latest

adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

[Claim 24]

The method according to claim 23, wherein said determination determines whether or not the adaptive bases are corrected in accordance with whether or not the error has converged,

wherein said method adds a group of k one-dimensional adaptive base if the error has converged and the error between the data to be encoded and the reconstructed data equal to or more than a predetermined value.

[Claim 25]

A encoding apparatus which encodes data in k-dimension to be encoded into k one-dimensional adaptive base groups, characterized by comprising:

data storing means for storing the data to be encoded into a predetermined memory;

base storing means for storing k one-dimensional adaptive base groups;

initializing means for initializing the k one-dimensional adaptive bases stored in said base storing means;

reconstruction means for reconstructing k-dimensional data from the k one-dimensional adaptive bases stored in the base storing means, using a predetermined conversion;

error calculation means for calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

determination means for determining whether or not the adaptive bases are corrected based on the error obtained by said error calculation means, correcting the adaptive bases stored in said base storing means, and repeating the processes of said reconstruction means and said error calculation means , if it is determined that the adaptive bases are corrected, while, outputting the latest adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

[Claim 26]

A product-sum arithmetic apparatus which executes product-sum arithmetic of k-dimensional weight distribution data $w(x_1, x_2, \ldots, x_k)$ and data $A(x_1, x_2, \ldots, x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot w(x_1, x_2, \ldots, x_k) dx_1 dx_2 \ldots dx_k ,$$

said apparatus characterized by

encoding the k-dimensional weight distribution data into at least one group of k one-dimensional adaptive bases $X_{11}(x_1), X_{21}(x_2), \ldots, X_{k1}(x_k)$ using the data encoding method according to any one of claims 5-7,

obtaining the product-sum using the data A and the one-dimensional adaptive base group based on

$$y = \sum_{l} \left[\iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot \prod_{k} x_{kl}(x_k) dx_1 dx_2 \ldots dx_k \right].$$

[Claim 27]

The apparatus according to claim 26, wherein arithmetic elements performing the product-sum are arranged in an array.

[Claim 28]

The apparatus according to claim 27, wherein one-dimensional adaptive base group is inputted into all of the arithmetic elements arranged in the array.

[Claim 29]

The apparatus according to claim 28, wherein all of the arithmetic elements arranged in the array perform the product-sum.

[Claim 30]

The apparatus according to claim 27, wherein one-dimensional adaptive base group is inputted into a portion of columns and row of the arithmetic elements arranged in the array.

[Claim 31]

The apparatus according to claim 30, wherein a portion of columns and row of the arithmetic elements arranged in the array perform the product-sum.

[Amendment 2]

[Name of Document to be Amended] Specification:

[Name of Item to be Amended] 0006

[Manner of Amendment] Change

[Content of Amendment]

[0006]

According to the present invention, provided is a method for encoding n data to be encoded, into an adaptive base each of which includes m data, characterized by comprising:

an initializing step of initializing the adaptive base;

a reconstruction step of reconstructing n data from the adaptive base using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting said adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

【書類名】 手続補正書
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【提出日】 平成18年 5月31日
【あて先】 特許庁長官殿
【事件の表示】
【出願番号】 特願2004-239792
【補正をする者】
【識別番号】 000001007
【氏名又は名称】 キヤノン株式会社
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【氏名又は名称】 大塚 康徳
【電話番号】 03-5276-3241
【連絡先】 担当は大塚 康弘
【発送番号】 162251
【手続補正1】
【補正対象書類名】 特許請求の範囲
【補正対象項目名】 全文
【補正方法】 変更
【補正の内容】
【書類名】特許請求の範囲
【請求項１】
ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、
所定の変換により前記適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、
所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記適応化基底を修正する修正ステップと、
前記算出した誤差の収束を判定するステップと
を有し、前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行うことを特徴とするデータ符号化方法。
【請求項２】
ｎ個のデータで構成される被符号化データを、少なくとも２つの、ｐ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、
所定の変換により前記少なくとも２つの適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、
所定の誤差評価関数により、前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記少なくとも２つの適応化基底を修正する修正ステップと、
前記算出した誤差の収束を判定するステップと
を有し、前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行うことを特徴とするデータ符号化方法。
【請求項３】
ｎ個のデータで構成される被符号化データを、少なくとも２つの、ｐ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、

所定の変換により１つの前記適応化基底から、ｎ個のデータからなる要素復元データを生成する復元ステップと、

所定の誤差評価関数により、差分被符号化データと前記要素復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記１つの適応化基底を修正する修正ステップと、

前記算出した誤差の収束を判定するステップとを有し、

前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行い、前記誤差が収束したと判定された場合に、次の新たな適応化基底、若しくは新たな１次元適応化基底組に対し、前記修正ステップを行う

ことを特徴とするデータ符号化方法。

【請求項４】

被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、請求項３に記載の前記被符号化データを用いて、少なくとも１組の、ｋ個の１次元適応化基底組$X_1(x_1)$、$X_2(x_2)$、…$X_k(x_k)$を生成し、

$$f(x_1,x_2,\cdots,x_k)=\sum_l\prod_k X_{kl}(x_k)$$

と展開表現することを特徴とするデータ符号化方法。

【請求項５】

被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、ｋ個の１次元適応化基底組$X_1(x_1)$、$X_2(x_2)$…、$X_k(x_k)$に符号化する方法であって、

前記１次元適応化基底組を初期化するステップと、

前記１次元適応化基底組から、復元データを次式で生成する復元ステップと、

$$\tilde{f}(x_1,x_2,\cdots,x_k)=\prod_k X_k(x_k)$$

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記１次元適応化基底組を修正する修正ステップと

を有することを特徴とするデータ符号化方法。

【請求項６】

被符号化データであるｋ次元空間分布データｆ（x_1、x_2、…、x_k）を、少なくとも２組の、ｋ個の１次元適応化基底組 に符号化する方法であって、

前記１次元適応化基底組を初期化するステップと、

前記１次元適応化基底組から、復元データを次式で復元する復元ステップと、

$$\tilde{f}(x_1,x_2,\cdots,x_k)=\sum_l\prod_k X_{kl}(x_k)$$

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記１次元適応化基底組を修正する修正ステップと

を有することを特徴とするデータ符号化方法。

【請求項７】

被符号化データであるｋ次元空間分布データ を、少なくとも２組の、ｋ個の１次元適応化基底組 に符号化する方法であって、

前記１次元適応化基底組を初期化するステップと、

１組の前記１次元適応化基底組から、要素復元データを次式で生成する復元ステップと

$$\tilde{f}(x_1,x_2,\cdots,x_k)=\prod_i X_{ki}(x_i)$$

所定の誤差評価関数により、差分被符号化データと前記要素復元データとの誤差を算出する誤差算出ステップと、

前記誤差に基づき前記１組の１次元適応化基底組を修正する修正ステップと

を有することを特徴とするデータ符号化方法。

【請求項８】

前記差分被符号化データは、前記被符号化データから、前記誤差の収束を判定するステップにより、前記誤差が収束したと判定された全ての前記適応化基底、若しくは前記１次元適応化基底組から復元される前記要素復元データを差し引いたものであることを特徴とする請求項３に記載のデータ符号化方法。

【請求項９】

前記修正ステップを、前記算出した誤差が予め定めた目標誤差以下になるまで繰り返し行うことを特徴とする請求項１乃至請求項３、請求項５乃至請求項７のいずれか１項に記載の記載のデータ符号化方法。

【請求項１０】

前記誤差評価関数は、前記符号化データ、若しくは前記差分被符号化データと、前記復元データ、若しくは前記要素復元データの各要素との２乗誤差の総和であることを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１１】

前記修正ステップにおいて、前記算出した誤差が減少するように、前記適応化基底、若しくは前記１次元適応化基底組の修正を行うことを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１２】

前記修正ステップにおいて、前記適応化基底、若しくは前記１次元適応化基底組の修正量は、前記誤差評価関数の、前記適応化基底の内の修正する要素、若しくは前記１次元適応化基底組の内の修正する要素での偏微分係数に、所定の係数を乗じたものであることを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１３】

前記所定の係数は、負の定数であることを特徴とする請求項１２に記載のデータ符号化方法。

【請求項１４】

前記所定の係数は、負の値であり、徐々に０に近づけることを特徴とする請求項１２に記載のデータ符号化方法。

【請求項１５】

前記被符号化データを、所定範囲で分割し、前記所定範囲ごとに符号化を行うことを特徴とする請求項１乃至請求項３、または請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１６】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項１７】

前記被符号化データを、周波数空間に変換し符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項記載のデータ符号化方法。

【請求項１８】

前記被符号化データを、周波数空間に変換し、周波数空間において所定範囲に分割し、前記所定範囲ごとに符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項

に記載のデータ符号化方法。

【請求項１９】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに周波数空間に変換し符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項２０】

前記被符号化データを、空間的に所定範囲で分割し、前記所定範囲ごとに周波数空間に変換し、前記周波数空間に変換された所定範囲ごとの所定周波数成分を周波数データとして合成し、前記周波数データの符号化を行うことを特徴とする請求項５乃至請求項７のいずれか１項に記載のデータ符号化方法。

【請求項２１】

ｋ次元荷重分布データｗ（x_1、x_2、…、x_k）と、ｋ次元分布データである被積和演算データＡ（x_1、x_2、…、x_k）とを次式で積和演算を行う積和演算方法であって、

$$y = \iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot w(x_1, x_2, \cdots, x_k) dx_1 dx_2 \cdots dx_k$$

前記ｋ次元荷重分布データを、請求項５乃至７のいずれか１項に記載のデータ符号化方法により、少なくとも１組の、ｋ個の１次元適応化基底組X_{11}（x_1）、X_{21}（x_2）、…、X_{k1}（x_k）に符号化し、

前記被積和演算データと、前記１次元適応化基底組を用いて、前記積和演算を次式で求める

$$y = \sum_i \left[\iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot \prod_k X_{ki}(x_k) dx_1 dx_2 \cdots dx_k \right]$$

ことを特徴とする積和演算方法。

【請求項２２】

ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する装置であって、

前記適応化基底を初期化する手段と、

所定の変換により前記適応化基底から、ｎ個のデータからなる復元データを生成する復元手段と、

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出手段と、

前記誤差に基づき前記適応化基底を修正する修正手段と、

前記算出した誤差の収束を判定する判定手段と

を有し、前記誤差が収束したと判定されるまで、前記修正手段による修正を繰り返し行うことを特徴とするデータ符号化装置。

【請求項２３】

ｋ次元の被符号化データを、ｋ個の一次元適応化基底の組に符号化するデータ符号化方法であって、

被符号化データを所定のメモリに記憶する記憶ステップと、

前記ｋ個の一次元適応化基底をメモリに確保し、初期化する初期化ステップと、

所定の変換により、前記メモリ内の一次元適応化基底から、ｋ次元の復元データを生成する復元ステップと、

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、

該誤差演算ステップで得られた誤差に基づき、前記適応化基底を修正するか否かを判定し、前記適応化基底を修正すると判定した場合には前記メモリの適応化基底を修正して、前記復元ステップ、誤差演算ステップを繰り返し、前記適応化基底を修正しないと判定した場合には、最後の適応化基底を符号化結果として出力する判定ステップと

を備えることを特徴とするデータ符号化方法。

【請求項２４】

前記判定ステップは、誤差が収束したか否かに基づいて適応化基底を修正するか否かを判定し、

収束したと判定した場合であって、被符号化データと前記復元データとの誤差が所定値以上の差を有する場合には、ｋ個の一次元適応化基底の組を更に追加することを特徴とする請求項２３に記載のデータ符号化方法。

【請求項２５】

ｋ次元の被符号化データを、ｋ個の一次元適応化基底の組に符号化するデータ符号化装置であって、

被符号化データを所定のメモリに記憶する被符号化データ記憶手段と、

前記ｋ個の一次元適応化基底を記憶する基底記憶手段と、

該基底記憶手段に記憶されたｋ個の一次元適応化基底を初期化する初期化手段と、

所定の変換により、前記基底記憶手段に記憶されたｋ個の一次元適応化基底から、ｋ次元の復元データを生成する復元手段と、

所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出手段と、

該誤差演算手段で得られた誤差に基づき、前記適応化基底を修正するか否かを判定し、前記適応化基底を修正すると判定した場合には前記基底記憶手段に記憶された適応化基底を修正して、前記復元手段、誤差演算手段を繰り返し、前記適応化基底を修正しないと判定した場合には、最後の適応化基底を符号化結果として出力する判定手段と、

を備えることを特徴とするデータ符号化装置。

【請求項２６】

ｋ次元荷重分布データｗ（ｘ１、ｘ２、…、ｘｋ）と、ｋ次元分布データである被積和演算データＡ（ｘ１、ｘ２、…、ｘｋ）とを次式で積和演算を行う積和演算装置であって、

$$y = \iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot w(x_1, x_2, \cdots, x_k) dx_1 dx_2 \cdots dx_k$$

前記ｋ次元荷重分布データを、請求項５乃至７のいずれか１項に記載のデータ符号化方法により、少なくとも１組の、ｋ個の１次元適応化基底組X_{11}（x_1）、X_{21}（x_2）、…、X_{k1}（x_k）に符号化し、

前記被積和演算データと、前記１次元適応化基底組を用いて、前記積和演算を次式で求める

$$y = \sum \left[\iint \cdots \int A(x_1, x_2, \cdots, x_k) \cdot \prod_k X_{k1}(x_k) dx_1 dx_2 \cdots dx_k \right]$$

ことを特徴とする積和演算装置。

【請求項２７】

前記積和演算装置において、積和演算を行なう演算素子がアレイ状に構成されていることを特徴とする請求項２６記載の積和演算装置。

【請求項２８】

前記積和演算装置において、１次元適応化基底組がアレイ状に構成された演算素子全てに入力されることを特徴とする請求項２７に記載の積和演算装置。

【請求項２９】

前記積和演算装置において、アレイ状に構成された演算素子全てにおいて前記積和演算が実行されることを特徴とする請求項２８に記載の積和演算装置。

【請求項３０】

前記積和演算装置において、１次元適応化基底組が、アレイ状に構成された演算素子の列・行のそれぞれ一部に入力されることを特徴とする請求項２７に記載の積和演算装置。

【請求項３１】

前記積和演算装置において、アレイ状に構成された演算素子の一部において前記積和演算が実行されることを特徴とする請求項３０に記載の積和演算装置。

【手続補正2】
【補正対象書類名】 明細書
【補正対象項目名】 ０００６
【補正方法】 変更
【補正の内容】
【０００６】
この課題を解決するため、例えば本発明の符号化方法は以下の工程を備える。すなわち、

ｎ個のデータで構成される被符号化データを、ｍ個のデータで構成される適応化基底に符号化する方法であって、
前記適応化基底を初期化するステップと、
所定の変換により前記適応化基底から、ｎ個のデータで構成される復元データを生成する復元ステップと、
所定の誤差評価関数により前記被符号化データと前記復元データとの誤差を算出する誤差算出ステップと、
前記誤差に基づき前記適応化基底を修正する修正ステップと、
前記算出した誤差の収束を判定するステップと
を有し、前記誤差が収束したと判定されるまで、前記修正ステップを繰り返し行うことを特徴とする。

[Name of Document] Argument
[Reference No.] 000262301I
[Date of Submission] May 31, 2006
[Addressee] Examiner of the Patent Office,
Tomohiko KITAMURA, Esq.
[Description of the Case]
[Application No.] Patent Application No. 2004-239792
[Applicant]
[Id. No.] 000001007
[Name] CANON KABUSHIKI KAISHA
[Agent]
[Id.No.] 100076428
[Patent Attorney]
[Name] Yasunori OHTSUKA
[Phone No.] 03-5276-3241
[Contact] Person in Charge : Yasuhiro OHTSUKA
[Dispatch No.] 162251
[Content of Argument]

We duly received the notification of reason for refusal dated April 17, 2006, (dispatch date: April 21, 2006), in response to the present application. Primary reasons for rejecting the application are as follows:

Reason for Rejection A
Rejected claims: 1-3, 8, 12-14, 18, 24, 25 and 27
Applied article: Patent Law Section 29(2)
Cited reference: Japanese Patent Laid-Open No. 08-021293

Reason for rejection B
Rejected claims: 24 and 25
Applied article: Patent Law Section 36(6-ii)

In consideration of the Examiner's remarks, applicant has clarified the present invention in the Amendment supplied under separate cover submitted herewith. Accordingly, we respectfully describe our arguments as below, in accordance with the post-amendment configuration of the present invention.

Claims of the present invention are as described in the Amendment supplied under separate cover. The correspondence between pre- and post-amendment claims are as follows:

Pre-amendment Claims		Post-amendment Claims
1 + 9	->	1
2 + 9	->	2
3 + 10	->	3
4	->	4
5	->	5
6	->	6
7	->	7
8 through 10	->	deleted
11	->	8 (amended to be dependent upon post-amendment claim 3)
12	->	9
13	->	10
14	->	11
15	->	12
16	->	13
17	->	14
18	->	15
19	->	16
20	->	17
21	->	18
22	->	19
23	->	20

24, 25	->	deleted
26	->	21
27 + 9	->	22 (apparatus invention corresponding to the post-amendment claim 1)
28	->	23
29	->	24
30	->	25 (amended to "apparatus" due to typographical error of the subject matter "method")
31	->	26
32	->	27
33	->	28
34	->	29
35	->	30
36	->	31

The Amendment supplied under separate cover merely limits the independent claims in the examined dependent claims, and changes the numbering of the claims owing to either deleting several claims and renumbering some dependent claims. There are no technical amendments, aside from amending an error in claim 25 (pre-amendment claim 30). Accordingly, applicant maintains that no explanation for the reasons for the amendments is required.

Applicant has limited the independent claims cited in Reason for Rejection A by adding the limitation of non-rejected claims. Applicant has responded to the citation of claims 24 and 25 in Reason for Rejection B by deleting the cited claims.

Accordingly, we believe that the objections in the Reason for Rejection A and the Reason for Rejection B would have been overcome by the Amendment supplied under separate cover.

Thus, we respectfully request you to re-examine and grant a patent for the subject application. Therefore, please

reconsider the examination with regard to the subject application as favorable reconsideration is requested for allowance for this application to be granted a patent.

【書類名】 意見書
【整理番号】 0002623011
【提出日】 平成18年 5月31日
【あて先】 特許庁審査官 北村 智彦 殿
【事件の表示】
【出願番号】 特願2004-239792
【特許出願人】
【識別番号】 000001007
【氏名又は名称】 キヤノン株式会社
【代理人】
【識別番号】 100076428
【弁理士】
【氏名又は名称】 大塚 康徳
【電話番号】 03-5276-3241
【連絡先】 担当は大塚 康弘
【発送番号】 162251
【意見の内容】
本件に対し、平成１８年４月２１日発送（同年４月１７日起案）の拒絶理由通知書を頂戴しました。
拒絶の理由の主旨は次の通りです。
・拒絶理由Ａ
対象請求項： １－３、８、１２－１４、１８、２４、２５、２７
適用条文 ： 特許法第２９条第２項
引用文献 ：特開平８－２１２９３号公報

・拒絶理由Ｂ
対象請求項： ２４、２５
適用条文 ： 特許法第３６条第６項第２号

出願人は上記の審査官殿のご指摘に鑑み、同時提出の別紙手続補正書にて本願発明をより明瞭なものと致しました。従いまして以下では、補正後の本願発明の構成に基づいて意見を申上げます。

本願発明の特許請求の範囲は、別紙手続補正書の通りですが、補正前請求項と補正後請求項との対応関係を示すと次のようになります。

補正前請求項		補正後請求項
１＋９	→	１
２＋９	→	２
３＋１０	→	３
４	→	４
５	→	５
６	→	６
７	→	７
８乃至１０	→	削除
１１	→	８（補正後の請求項３を引用するように補正）
１２	→	９
１３	→	１０
１４	→	１１
１５	→	１２
１６	→	１３

１７	→	１４	
１８	→	１５	
１９	→	１６	
２０	→	１７	
２１	→	１８	
２２	→	１９	
２３	→	２０	
２４及び２５	→	削除	
２６	→	２１	
２７＋９	→	２２	（補正後の請求項１に対応する装置の発明です）
２８	→	２３	
２９	→	２４	
３０	→	２５	（主題の「方法」が誤記の為、「装置」と補正しました）
３１	→	２６	
３２	→	２７	
３３	→	２８	
３４	→	２９	
３５	→	３０	
３６	→	３１	

別紙手続補正書による補正は、上記の通り、単純に、審査された引用形式の請求項の要件で独立形式請求項を限定したものであり、また、幾つかの請求項を削除したことによる請求項の番号及び、引用形式の請求項中の引用請求項の番号が繰り上がった点、及び、請求項２５（補正前請求項３０）の誤記の補正以外の技術的な補正はございません。それ故、その補正の根拠につきましては、ご説明するまでもないと存じます。

以上の通り、補正後の特許請求の範囲において、拒絶理由Ａで指摘された請求項中の各独立形式請求項につきましては、拒絶対象外の請求項で限定しました。
また、拒絶理由Ｂにつきましては、ご指摘の請求項２４及び２５を削除することで対処致しました。

従いまして、別紙手続補正書による補正により、ご指摘頂いた拒絶理由Ａ，Ｂにつきましては、これを解消したと確信いたします。

このような次第ですので、お手数をお掛けいたしますが本願につきまして再度のご審査のうえ、特許査定を賜りたくお願い申し上げる次第であります。

Decision to Grant a Patent

Application number: Application for patent 2004-239792
Date of Drafting: Heisei 18(2006) July Five days
Patent examiner: KITAMURA, Norihiko 9297 5K00
Title of invention: The coding method, equipment, a computer program, and computer-readable storage
The number of claims: 31
Applicant: CANON KABUSHIKI KAISHA
Representative: OHTSUKA, Yasunori (and 3 others)

This application is to be granted a patent as there is no reason for refusal.

Director General(p.p.) Director(p.p.) Examiner Assistant examiner Manager for Determination of Classification FUJII, Hiroshi KITAMURA, Norihiko KITAMURA, Norihiko 8625 9297 9297

1. Distinction of Patent: Usually
2. Reference documents: **
3. Application of Patent Law, Section 30: Nothing
4. Change of Title of Invention: Nothing
5. International Patent Classification (IPC)

H03M 7/30 B, G06T 9/00 , H04N 1/41 B, H04N 7/133 Z

6. Deposition of Microorganism

7. Display of Purport that Retroactivity of Filing Date is not Accepted

Decision to Grant a Patent(Memorandum)

Application number: Application for patent 2004-239792

1. Technical Fields to Be Searched (IPC, DB Name)
H03M3/00-11/00G06T 9/00 H04N 1/41 H04N 7/30

2. Reference patent documents
JP,08-212193,A (JP, A) JP,10-028058,A (JP, A) JP,06-237179,A (JP, A) JP,2001-326935,A (JP, A)

3. Reference books and magazines

[Translation done.]

00862.514141. PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	:	Examiner: Not Yet Assigned
YUSUKE MITARAI, ET AL.	)	
	:	Art Unit: 2112
Appln. No.: 10/580,327	)	
	:	Conf. No. 5699
Filed: May 24, 2006	)	
	:	
For: CODING METHOD AND APPARATUS, AND COMPUTER PROGRAM AND COMPUTER-READABLE STORAGE MEDIUM	)	
	:	October 25, 2007
	)	

The Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Sir:

Preliminary to examination, the Examiner is respectfully requested to amend the above-identified application as follows.

I hereby certify that this correspondence is being transmitted by facsimile to the U.S. Patent and Trademark Office at (571) 273-0125, on:

October 25, 2007
(Date of Deposit)

Raymond A. DiPerna
(Name of Attorney for Applicants)

Signature

October 25, 2007
Date of Signature

IN THE CLAIMS

The following is a complete listing of the claims, and replaces all earlier versions and listings.

1. – 15. (Cancelled)

16. (New) A method for encoding n data to be encoded, into an adaptive base each of which includes m data, comprising:

an initializing step of initializing the adaptive base;

a reconstruction step of reconstructing n data from the adaptive base using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting said adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

17. (New) A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of reconstructing n data from said at least two adaptive bases using a predetermined conversion;

an error calculation step of calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

a correction step of correcting the at least two adaptive bases based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged.

18. (New) A method for encoding n data to be encoded, into at least two adaptive bases each of which includes p data, comprising:

an initializing step of initializing the adaptive bases;

a reconstruction step of generating element reconstruction data configured of n data, from one adaptive base using a predetermined conversion;

an error calculation step of calculating an error between difference data to be encoded and said element reconstruction data by using a predetermined error evaluation function;

a correction step of correcting said one adaptive base based on said error; and

a step of determining whether or not said error calculated in said error calculation step has converged,

wherein correction in said correction step is repeated until it is determined that said error has converged, and if it is determined that said error has converged, said correction in said correction step for a next new adaptive base or a new set of one dimensional adaptive bases.

19. (New) The data encoding method, wherein said data to be encoded are data $f(x_1, x_2, ..., x_k)$ in k-dimensional space distribution, and said data to be encoded according to claim

18 is represented by, using at least one set of k one-dimensional adaptive base groups $X_1(x_1)$, $X_2(x_2)$, ..., $X_k(x_k)$,

$$f(x_1, x_2, \ldots, x_k) = \sum_l \prod_k x_{kl}(x_k)$$

20. (New) A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into k one-dimensional adaptive base groups $X_1(x_1)$, $X_2(x_2)$,..., $X_k(x_k)$, comprising;

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base groups based on

$$\bar{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k);$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting the one-dimensional adaptive base groups based on said error.

21. (New) A method for encoding data $f(x_1, x_2, \ldots, x_k)$, to be encoded, in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of reconstructing data from the one-dimensional adaptive base group based on

$$\bar{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k).$$

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said adaptive base groups based on said error.

22. (New) A method for encoding data to be encoded in k-dimensional space distribution, into at least two pairs of k one-dimensional adaptive base groups, comprising:

an initializing step of initializing the one-dimensional adaptive base groups;

a reconstruction step of generating element reconstructed data from the one pair of the one-dimensional adaptive base groups based on

$$\tilde{f}(x_1, x_2, \ldots, x_k) = \prod_k x_k(x_k)$$

an error calculation step of calculating an error between said data to be encoded and said element reconstructed data by using a predetermined error evaluation function; and

a correction step of correcting said one pair of the one-dimensional adaptive base groups based on said error.

23. (New) The method according to claim 18, wherein the difference data to be encoded is obtained by subtracting, from data to be encoded, all of the adaptive bases when said error in said error calculation step has converged or the element reconstructed data reconstructed from the one-dimensional adaptive base groups.

24. (New) The method according to claim 16, wherein said correction in said correction step is repeated until said error is equal to or less than a predetermined target error.

25. (New) The method according to claim 16, wherein the predetermined error evaluation function calculates a total of the second power of the error between the data to be encoded

or the difference data to be encoded and the reconstructed data or the element reconstructed data.

26. (New) The method according to claim 16, wherein in said correction step, the adaptive bases or the one-dimensional adaptive base group is corrected so as to reduce the error.

27. (New) The method according to claim 16, wherein in said correction step, the correction amount for the adaptive bases or the one-dimensional adaptive base group is obtained by multiplying a predetermined coefficient to a partial differentiation coefficient of element to be corrected in the adaptive base or the one-dimensional adaptive base group in the predetermined error evaluation function.

28. (New) The method according to claim 27, wherein the predetermined coefficient is a negative constant.

29. (New) The method according to claim 27, wherein the predetermined coefficient is a negative and is changed so as to approximate it to "0" in stages.

30. (New) The method according to claim 16, wherein the data to be encoded is divided for a unit of a predetermined range, and the encoding is made for each the predetermined range.

31. (New) The method according to claim 16, wherein the data to be encoded is divided for spatially a unit of predetermined space, and the encoding is made for each predetermined range.

32. (New) The method according to claim 20, wherein the data to be encoded is converted into frequency spaces for encoding.

33. (New) The method according to claim 20, wherein the data to be encoded is converted into frequency spaces, and divided into predetermined ranges in the space for encoding for each predetermined range.

34. (New) The method according to claim 20, wherein the data to be encoded is divided into spatially predetermined ranges for encoding for each predetermined range.

35. (New) The method according to claim 20, wherein the data to be encoded is divided into spatially predetermined ranges to convert into frequency spaces for each predetermined range and a predetermined component converted into the predetermined frequency spaces is composited as a frequency data, wherein the encoding is made for the frequency data.

36. (New) A product-sum arithmetic method for executing product-sum arithmetic of k-dimensional weight distribution data $w(x_1,x_2,...,x_k)$ and data $A(x_1, x_2, ..., x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint\cdots\int A(x_1, x_2, ..., x_k) \cdot w(x_1, x_2, ..., x_k) dx_1 dx_2 ... dx_k ,$$

said method comprising:

encoding the k-dimensional weight distribution data into at least one set of k one-dimensional adaptive bases $X_{11}(x_1),X_{21}(x_2),..., X_{kl}(x_k)$ using the data encoding method according to claim 20,

obtaining the product-sum using the data Λ and the one-dimensional adaptive base group based on

$$y = \sum_{l}\left[\iint \cdots \int \Lambda(x_1, x_2, \ldots, x_k) \cdot \prod_{k} x_{kl}(x_k)\, dx_1 dx_2 \ldots dx_k \right].$$

37. (New) A encoding apparatus which encodes n data to be encoded into adaptive base which includes m data, comprising:

initializing means for initializing the adaptive base;

reconstruction means for reconstructing n data from the adaptive base using a predetermined conversion;

error calculation means for calculating an error between said n data to be encoded and said reconstructed n data by using a predetermined error evaluation function;

correction means for correcting said adaptive base based on said error; and

determination means for determining whether or not said error calculated by said error calculation means has converged,

wherein correction of said correction means is repeated until it is determined that said error has converged.

38. (New) A encoding method for encoding data in k-dimension to be encoded into k one-dimensional adaptive base groups, comprising:

a storing step of storing the data to be encoded into a predetermined memory;

an initializing step of allocating and initializing a memory for storing the k one-dimensional adaptive bases;

a reconstruction step of reconstructing data in k-dimension from the adaptive base stored in the memory, using a predetermined conversion;

an error calculation step of calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

a determination step of determining whether or not the adaptive bases are corrected based on the error obtained in the error calculation step, correcting the adaptive bases in the memory, and repeating the processes of said reconstruction step and said error calculation step, if it is determined that the adaptive bases are corrected, while, outputting the latest adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

39. (New) The method according to claim 38, wherein said determination determines whether or not the adaptive bases are corrected in accordance with whether or not the error has converged,

wherein said method adds a group of k one-dimensional adaptive base if the error has converged and the error between the data to be encoded and the reconstructed data equal to or more than a predetermined value.

40. (New) An encoding apparatus which encodes data in k-dimension to be encoded into k one-dimensional adaptive base groups, comprising:

data storing means for storing the data to be encoded into a predetermined memory;

base storing means for storing k one-dimensional adaptive base groups;

initializing means for initializing the k one-dimensional adaptive bases stored in said base storing means;

reconstruction means for reconstructing k-dimensional data from the k one-dimensional adaptive bases stored in the base storing means, using a predetermined conversion;

error calculation means for calculating an error between said data to be encoded and said reconstructed data by using a predetermined error evaluation function;

determination means for determining whether or not the adaptive bases are corrected based on the error obtained by said error calculation means, correcting the adaptive bases stored in said base storing means, and repeating the processes of said reconstruction means and said error calculation means, if it is determined that the adaptive bases are corrected, while, outputting the latest adaptive bases as encoded result if it is determined that the adaptive bases are not corrected.

41. (New) A product-sum arithmetic apparatus which executes product-sum arithmetic of k-dimensional weight distribution data $w(x_1,x_2,...,x_k)$ and data $A(x_1,x_2,...,x_k)$ to be product-summed as being k-dimensional distribution data based on

$$y = \iint \cdots \int A(x_1, x_2, \ldots, x_k) \cdot w(x_1, x_2, \ldots, x_k) dx_1 dx_2 \ldots dx_k ,$$

said apparatus characterized by

encoding the k-dimensional weight distribution data into at least one group of k one-dimensional adaptive bases $X_{11}(x_1), X_{21}(x_2), \ldots, X_{k1}(x_k)$ using the data encoding method according to claim 20.

obtaining the product-sum using the data Λ and the one-dimensional adaptive base group based on

$$y = \sum_{l}\left[\iint\cdots\int A(x_1, x_2, \ldots, x_k)\cdot\prod_{k} x_{kl}(x_k)\,dx_1 dx_2 \ldots dx_k \right].$$

42. (New) The apparatus according to claim 41, wherein arithmetic elements performing the product-sum are arranged in an array.

43. (New) The apparatus according to claim 42, wherein one-dimensional adaptive base group is inputted into all of the arithmetic elements arranged in the array.

44. (New) The apparatus according to claim 43, wherein all of the arithmetic elements arranged in the array perform the product-sum.

45. (New) The apparatus according to claim 42, wherein one-dimensional adaptive base group is inputted into a portion of columns and row of the arithmetic elements arranged in the array.

46. (New) The apparatus according to claim 45, wherein a portion of columns and row of the arithmetic elements arranged in the array perform the product-sum.

REMARKS

Claims 16-46 are now pending in this application. Claims 1-15 have been canceled without prejudice or disclaimer of subject matter. Claims 16-46 have been added. Claims 16-18, 20-22, 36-38, 40, and 41 are independent.

Favorable consideration and early passage to issue are respectfully requested.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

Raymond A. DiPerna
Attorney for Applicants
Registration No.: 44,063

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200
#1705353 v1

FORM PTO 1449 (*modified*)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

LIST OF REFERENCES CITED BY APPLICANT(S)
(Use several sheets if necessary)

ATTY DOCKET NO. 00862.514141	APPLICATION NO. 10/580,327
APPLICANT YUSUKE MITARAI, ET AL.	
FILING DATE May 24, 2006	GROUP 2112

U.S. PATENT DOCUMENTS

*EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES/NO/ OR ABSTRACT
	JPA	8-212193	8/20/96	JAPAN			Abstract
	JPA	06-237179	8/23/94	JAPAN			Abstract
	JPA	2001-326935	11/22/01	JAPAN			Abstract
	JPA	10-028058	1/27/98	JAPAN			Abstract

OTHER DOCUMENT(S) (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Sheet___ of ___

Form #62

FCHS_WS 1705482v1

000862.514141. PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	:	Examiner: Not Yet Assigned
YUSUKE MITARAI, ET AL.	)	
	:	Art Unit: 2112
Application No.: 10/580,327	)	
	:	Conf. No.: 5699
Filed: May 24, 2006	)	
	:	
For: CODING METHOD AND APPARATUS, AND COMPUTER PROGRAM AND COMPUTER-READABLE STORAGE MEDIUM	)	October 25, 2007

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT ACCOMPANYING PPH REQUEST

Sir:

In compliance with the duty of disclosure under 37 C.F.R. § 1.56 and in accordance with the practice under 37 C.F.R. §§ 1.97 and 1.98, the Examiner's attention is directed to the four documents listed on the attached Form PTO-1449. Copies of the listed documents have been submitted previously, as have been English abstracts therefor.

I hereby certify that this correspondence is being transmitted by facsimile to the U.S. Patent and Trademark Office at (571) 273-0125 on
October 25, 2007
(Date of Transmission)

Raymond A. DiPerna, Reg. No. 44,063
(Name of Attorney for Applicant)

Signature

October 25, 2007
Date of Signature

The four listed documents are the information of record in the Office Action dated April 21, 2006 in a Japanese counterpart of this application, i.e., Japanese Patent Application 2004-239792, from which this application claims priority under 35 U.S.C. § 119.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

Raymond A. DiPerna
Attorney for Applicants
Registration No.: 44,063

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